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THE

Connecticut Agricultural Experiment Station,

NEW HAVEN, CONN.

BULLETIN No. 110.

DECEMBER, 1891.

The Bulletins of this Station, issued quarterly or oftener, are mailed free to every citizen of Connecticut who applies for them and to others as far as the limited editions permit.

Applications should be renewed annually before March 1st.

Citizens of other States desiring to secure the Bulletins regularly are referred to notice on next page.

The matter of this Bulletin, that has any permanent value, will be carefully revised and made part of the next annual Report of the Director of this Station.

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NOTICE AS TO SUPPLY OF STATION REPORTS.

The Annual Report of this Station for the current year, to be printed at State expense, is limited to an edition of 7,000 copies, of which 5,000 copies are bound and distributed by the Secretary of the Board of Agriculture, T. S. Gold, West Cornwall. After exchanging with other Experiment Stations and Agricultural Journals, the remaining Reports will be sent first to *Citizens of Connecticut* who shall apply for them. These copies will be supplied in the order in which the applications are received until the edition is exhausted, and if the demand in the State continues as heretofore, few or none will remain for distribution outside of Connecticut.

Extra copies can, however, be secured if called for before the printing-forms are broken up. Such copies will be struck off and supplied early next year to *Citizens of other States who apply to this Station before February 1st, and who remit 25 cents per copy to defray costs*. This remittance will also secure to the sender a copy of each Bulletin issued by this Station during next year.

Coin may be forwarded by Post at sender's risk with very small chance of loss, if properly mailed, as follows: Cut an inch hole in a card or scrap of thin paper-box that will just fit inside an envelope, fasten a twenty-five cent piece in the cavity by pasting paper over it on both sides of the card, write thereon name and Post office address, inclose within an envelope, and send as a letter prepaid in full. P. O. stamps cannot be accepted.

THE SAMPLING OF CANADA ASHES.

A quantitative analysis of ashes, as of anything else, is an expensive operation, and when it is made at public expense and in the general interest, rather than for an individual at his own expense, the one who is responsible for the sample should be all the more careful that his part of the work is very accurately done. Accurate sampling is just as important as accurate analysis and is often harder to secure.

If an analysis of a shipment of Canada ashes is desired the sample must be drawn immediately on receipt of the goods and sent to the Station at once.

It is not easy to get a perfectly fair sample of a car load of ashes as it is unloaded or as it lies in a pile after unloading. But it is much less easy to get a fair sample after the ashes have lain for any time on damp earth or have been rained upon, or have been for any considerable time where they could either dry out or absorb water from the air. After being rained upon the sample taken may be very much richer or very much poorer in potash than the whole lot from which it was drawn and whose character it is designed to represent. For under a heavy rain the ashes near the surface of the heap are leached, the rain dissolving the potash and carrying it down into the pile. But after a few days of dry weather the water as it comes to the surface of the pile and evaporates may bring with it to the surface not only what potash was carried down by the rain but also much more from within the pile. So that the interior of the heap is partly leached and the outside is abnormally rich in potash.

If the ashes are in bulk in the car, tight barrels should be provided and as the ashes are shoveled into wagons a shovel full should occasionally and at fairly regular intervals, be thrown into a barrel. Five hundred pounds is not too large a sample to take from a car load. When the car is otherwise empty this sample should be poured together on the floor, thoroughly shoveled over and then from half a peck to a peck should be gathered in small portions from all parts of this sample lot, securely boxed and sent at once to this Station.

If the ashes are in sacks or barrels the same method of sampling may be followed as with commercial fertilizers. The contents of barrels may be sampled as the barrels are emptied in the field or barn, but if in sacks the ashes should be sampled at the car.

ANALYSES OF CANADA ASHES.

Here follow all the analyses of Canada ashes thus far made during the year. The first two analyses, Nos. **3361** and **3379**, were made on samples drawn by a Station agent experienced in the work. The other samples were drawn by dealers or consumers. As the following data show, some of them certainly did not at all represent the goods whose value they were intended to fix, but the analyses are published to emphasize the need of great care in drawing and bottling the samples and of sending us full particulars regarding them.

ANALYSES OF UNLEACHED CANADA ASHES.

	3361	3362	3378	3360	3368	3385	3396	3397	3380	3395	3379	3367	3384
Potash, soluble in water---	2.92	11.14	5.01	14.49	4.10	3.93	4.74	4.42	7.17	8.75	4.65	3.19	4.00
Phosphoric acid -----	1.28	1.27	1.50 ^e	1.13	1.44	1.22	1.42	1.34	1.34	.96	1.48	1.06	1.53
Carbonate of lime*-----	56.40	----	50.60	63.20	57.50	46.90	53.60	45.80	56.10	59.60	57.20	66.50	76.32
Sand and silica-----	13.97	6.39	12.83	6.08	10.80	24.20	20.24	27.08	14.75	19.33	10.65	8.15	10.17
Water, expelled at 212° ---	15.92	----	17.80	9.00	16.00	11.40	4.45	7.35	6.42	3.45	15.05	10.12	1.73
Cost per ton -----	\$12.00	10.00	10.00	12.00†	12.00†	10.50†	12.00	10.50†	12.00†	15.00†			

* Equivalent to the total calcium oxide (CaO) found soluble in hydrochloric acid.

No. **3361**, sampled by a Station agent, was guaranteed to contain $5\frac{1}{2}$ per cent. potash and $1\frac{1}{2}$ per cent. phosphoric acid. When the dealer was informed of the result of the analysis he promptly remitted to the purchaser a sum sufficient to fully cover the discrepancy between the guaranteed and actual composition. Subsequent investigation by the dealer convinced him that the poor quality of the ashes was due to their being put in hired storage, before shipment, which storage did not fully protect them from wetting.

The two samples, **3362** and **3378**, are instructive, as it is alleged that both were taken from the same lot. No. **3362** was sent with a letter from which it was fairly inferred that a number of purchasers had joined in a purchase and in drawing and sending the samples. After the analysis was reported and inquiry made the purchaser wrote, "It was drawn by the dealer and some other gentlemen who assured me that it was a fair sample of the cargo [boat load]. I did not see the drawing. I have ten tons of the same ashes and will very carefully take a sample."

Regarding the second sample, **3378**, he writes, "I send you a carefully drawn sample of those ashes. I got it by digging three holes in different sides of the pile not too near the bottom and taking out of each and mixing thoroughly together." The second sample was taken sometime after the first one. In the meantime the ashes had lain in a pile on the ground but the purchaser thinks had not been rained on.

It will be seen that the first sample drawn by the dealer contained 11.14 per cent. of water-soluble potash. The second sample, drawn by the purchaser, contained 5.01 per cent. of potash, less than half as much.

The purchaser of the sample **3360**, wrote when sending it, "The car load was purchased by me from Canada, price \$12.00 per ton delivered here. I think them very fine if they show up as well as they look." Later, after the analysis was made, he wrote replying to inquiry: "I had ordered a car of ashes from Canada and requested the dealer to send me a sample of them by mail when loaded. I used what I wished to" (of the sample) "then sent them to you. On receiving your report I wrote to the seller who states that he was not there when the car was loaded and he thinks *his man sent me that sample from another lot* of ashes made entirely from elm wood!"

It should not need to be said that a sample drawn at random

by the hired man of a dealer in Canada has little worth in fixing the value of a car load of ashes delivered here in Connecticut.

When the car load arrived the purchaser drew a sample himself and sent it to the Station properly authenticated. This is No. **3368** in the table. The sample drawn in Canada by the dealer's "man" showed 14.49 per cent. of potash, the one drawn from the goods delivered showed 4.10 per cent.—less than one-third as much.

Samples **3367** and **3384**, representing a lot originally consisting of $15\frac{1}{2}$ tons, were sent from Darien, Ct. The analysis of **3367** was so unsatisfactory to the seller living in Ontario, Canada—he having guaranteed 5 per cent. or over of potash—that he desired another analysis from a fresh sample. This is stated to have been drawn from the remaining ashes in the manner requested by him, from the center of the parcel. A noticeable difference between the two samples is the 8.4 per cent. less moisture contained in the latter. **3367** was sent to the Station, Sept. 10th, and **3384** Oct. 16th. Both were sent in small paper boxes and loss or gain of moisture may have easily occurred.

When the analyses are recalculated, after deducting the variable moisture, we have in the *dry ashes* the following percentages :

	3367.	3384.
Potash, soluble in water	3.54	4.03
Phosphoric acid	1.18	1.55
Carbonate of lime	73.98	77.66
Sand and silica	9.06	10.34

A more complete analysis of **3384** serves to show the amounts of the other ingredients in these ashes.

Potash, soluble in water	4.00
Soda, " "50
Lime, soluble in hydrochloric acid	42.74
Magnesia " " "	4.03
Sulphuric acid, soluble in hydrochloric acid82
Phosphoric acid, " " "	1.53
Carbonic acid	24.49
Sand and silica, insoluble in acid	10.17
Charcoal	2.09
Moisture	1.73
Alumina, oxides of iron, and manganese, and undetermined matters of no fertilizing value	7.90
	<hr/> 100.00

In view of the experience of the past season, the Station declines to analyze, at public expense, any samples of wood or cotton hull ashes which are not drawn in accordance with its directions and *fully* described on a blank form which will be sent to any one in the State on application.

SUBSTITUTES FOR UNLEACHED ASHES.

Very considerable quantities of ashes are annually brought into the State from Canada. There is no way of learning the total quantity, but we are informed that in Westport, Southport and near-lying towns alone about 800 tons have been sold the last season. In view of the fact that the quality of the "Canada ashes" sold in Connecticut has deteriorated of late it is worth considering whether a substitute as serviceable and considerably cheaper may not be found. A ton of unleached Canada ashes of good quality contains:

Sand, earth and coal.....	260 pounds.
Water	240 "
Oxide of iron, alumina, carbonate of soda, etc.	131 "
Actual potash	110 "
Phosphoric acid.....	39 "
Carbonate with some hydrate of lime and magnesia	1220 "
	<hr/> 2000

The agricultural value of ashes consists largely in the finely divided carbonate of lime which they contain, which is of great account in many cases as an amendment and in promoting the processes of decay and nitrification within the soil.

It is safe to say that the carbonates and phosphates of potash, magnesia and lime constitute the entire agricultural value of ashes. Can we then provide 110 pounds of potash, 39 of phosphoric acid and 1220 of carbonate of lime in fine condition in some other form cheaper than ashes?

An application in the late fall of 20 bushels of burned oyster shell lime (40 pounds to the bushel), at 12 cents per bushel would supply as much lime as a ton of ashes at a cost \$2.40, 500 pounds of cotton hull ashes in addition would cost \$8.75 and supply as much or more potash than a ton of Canada ashes and very considerably more phosphoric acid. The weight of these two things would be 1300 pounds as against 2000 pounds of Canada ashes

which involves a saving in cartage—the cost \$11.15, a little less than Canada ashes cost on the average.

The comparison is here made with ashes of excellent quality. With ashes of lower grade which are more common in our markets to-day, the showing for the substitute would be much more favorable.

Or if cotton hull ashes are not available, for them may be used 220 pounds of high grade sulphate of potash and 150 pounds of some cheap steamed bone like Peter Cooper's Bone, and 800 pounds of oyster shell lime, the three costing \$11.10.

The above named mixtures would be close imitations of superior wood ashes not only as respects the kinds and proportions of fertilizing elements, but also as to the forms or combinations of those elements. Still cheaper and in most cases probably no less effective, would be a mixture of 800 pounds (20 bushels) of burned oyster shell lime with 150 pounds of Peter Cooper's Bone and 220 pounds of muriate of potash—the total weighing 1170 pounds and costing \$9.45.

The oyster shell lime being caustic should be put on in the late fall or early spring and being fine and pulverulent it will soon be converted into carbonate.

Stone lime could be used instead of oyster shell lime but being in hard lumps would require slacking before being sown. The sulphate or muriate of potash and bone are best applied in spring.

It is hoped that our farmers may make thorough trial of these substitutes which are considerably cheaper than the average of Canada ashes, quality as well as price being taken account of.

A REQUEST FOR SAMPLES OF INDIAN CORN.

The attention of raisers of Indian corn is specially called to the following, which has already been sent as a circular to the secretaries of all Connecticut granges and other farmer's societies.

It is said that a larger number of old, well established varieties of Indian corn are grown in Connecticut than in any other State in the Union.

Some of these have been raised in one place for more than a century, and during that time have been strikingly improved by selection.

It is very desirable that specimens of these varieties should be collected, with all available information regarding their names, origin, history, improvement under selection, and actual yield per acre. This is especially so in view of the Columbian Exposition at Chicago in 1893, where there should be a fair exhibit of the leading agricultural products of this State. It is also important that a full set of samples be kept in the State for the instruction of our citizens.

The collection should be begun at once, as it cannot well be made complete in one season. This Station, therefore, asks the co-operation of farmers in an attempt to prepare an exhibit of Indian corn which shall do credit to the State. To this end the Director invites Granges, Farmers' Clubs and Farmers to furnish this Station samples of corn selected from this year's crop, of those varieties which have been raised in Connecticut for a term of years, and of new kinds which are considered valuable.

Ten ears of field-cured corn (with the husk attached if possible), should be selected which fairly represent the *average quality* of the variety. Besides, four ears of extra size of each variety are desirable.

Each ear should be separately wrapped in plenty of dry paper, and the whole, tied firmly together, should be packed with straw in a box; or, if that cannot be done, should be so carefully done up in cotton and stout paper that the ears cannot be in any way injured in transportation. The samples may then be sent by express to the Connecticut Agricultural Experiment Station, New Haven. In all cases the shipper's name should be enclosed in or marked on the package. If several varieties are sent together, each variety should be separately labeled with its name. The Station will pay the express charges.

At the time of forwarding the samples, fill out and return answers to the following questions respecting each variety.

1. Name most commonly used and all other names which are sometimes applied.
2. How long raised by you or in your town.
3. Where the seed was first obtained.
4. Whether it has changed its habit of growth, and how.
5. Number of rows to ear, ; of ears to stalk,
6. Time of planting, ; of ripening,
7. Average and maximum height of stalks.
8. Average yield of shelled corn and of stalks or stover, under ordinary conditions.
9. Yield under very favorable conditions. State year and specify the conditions.

10. Planted in hill or drill. Number of stalks in hill. Distance between hills and rows, or between plants and rows in drill.

11. How manured and cultivated.

12. Any other data regarding the sample which the sender thinks important.


13. Name and Post office address of the sender.

The Station will receive and store the samples, will keep with each the sender's name and address, and all data regarding the sample, will make such Chemical Examinations as may seem desirable, and will endeavor to have all the samples properly exhibited at the Columbian Exposition as well as *permanently preserved in the Station Museum*.

In order that the sending of many duplicate samples may be avoided, it is asked that those having corn suitable for the exhibit will *notify the Station at once, naming the varieties* which they are prepared to furnish. The Station will then write in reply, advising whether to send or stating that the kind is already sufficiently represented among the samples received or promised.

Copies of the foregoing questions with blanks for answers will be furnished on application.

Correction.—In Bulletin 109, page 40, the cost of the two mixtures made by E. J. Wells, Nos. 3281 and 3282, are given as \$39.60 and \$38.73 respectively. These figures were reckoned from the average retail cash prices of the ingredients to which was added \$1.50 per ton for freight. We have recently been informed that the actual prices paid by Mr. Wells for the materials of the two formulas were \$34.50 and \$31.50 per ton *delivered*.

 Citizens desiring the Bulletins of this Station should renew their applications before March.

S. W. JOHNSON, *Director*.



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